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BENJAMIN FRANKLIN: AS PRINTER AND PHILOSOPHER.[1]

THE facts about Franklin as a printer are simple and plain, but impressive. His father, respecting the boy's strong disinclination to become a tallow-chandler, selected the printer's trade for him, after giving him opportunities to see members of several different trades at their work, and considering the boy's own tastes and aptitudes. It was at twelve years of age that Franklin signed indentures as an apprentice to his older brother James, who was already an established printer. By the time he was seventeen years old he had mastered the trade in all its branches so completely that he could venture with hardly any money in his pocket first into New York and then into Philadelphia without a friend or acquaintance in either place, and yet succeed promptly in earning his living. He knew all departments of the business. He was a pressman as well as a compositor. He understood both newspaper and book work. There were at that time no such sharp subdivisions of labor and no such elaborate machinery as exist in the trade to-day, and Franklin could do with his own eyes and hands, long before he was of age, everything which the printer's art was then equal to. When the faithless Governor Keith caused Franklin to land in London without any resources whatever except his skill at his trade, the

[1] Address before the meeting of the American Philosophical Society to commemorate the two-hundredth anniversary of the birth of Benjamin Franklin, Philadelphia, April 20, 1906.

youth was fully capable of supporting himself in the great city as a printer. Franklin had been induced by the governor to go to England, where he was to buy a complete outfit for a good printing office to be set up in Philadelphia. He had already presented the governor with an inventory of the materials needed in a small printing office, and was competent to make a critical selection of all these materials; but when he arrived in London on this errand he was only eighteen years old. Thrown completely on his own resources in the great city, he immediately got work at a famous printing house in Bartholomew Close; but soon moved to a still larger printing house, in which he remained during the rest of his stay in London. Here he worked as a pressman at first, but was soon transferred to the composing room, evidently excelling his comrades in both branches of the art. The customary drink money was demanded of him, first by the pressmen with whom he was associated, and afterwards by the compositors. Franklin undertook to resist the second demand; and it is interesting to learn that after a resistance of three weeks he was forced to yield to the demands of the men by just such measures as are now used against any scab in a unionized printing office. He says in his autobiography: "I had so many little pieces of private mischief done me by mixing my sorts, transposing my pages, breaking my matter, and so forth, if I were ever so little out of the room * * * that, notwithstanding the master's protection, I found myself obliged to comply and pay the money, convinced of the folly of being on ill terms with those one is to live with continually." He was stronger than any of his mates, kept his head clearer because he did not fuddle it with beer, and availed himself of the liberty which then existed of working as fast and as much as he chose. On this point he says: "My constant attendance (I never making a St. Monday) recommended me to the master; and my uncommon quickness at composing occasioned my being put upon all work of dispatch, which was generally better paid. So I went on now very agreeably."

On his return to Philadelphia Franklin obtained for a few months another occupation than that of printer; but this employment failing through the death of his employer, Franklin returned to printing, becoming the manager of a small printing office, in which he was the only skilled workman and was expected to teach several green hands. At that time he was only twenty-one years of age. This printing office often wanted sorts, and there was no type-foundry in America. Franklin succeeded in contriving a mold, struck the matrices in lead, and thus supplied the deficiencies of the office. The autobiography says: "I also engraved several things on occasion; I made the ink; I was warehouse man and everything, and in short quite a factotum." Nevertheless, he was dismissed before long by his incompetent employer, who, however, was glad to reengage him a few days later on obtaining a job to print some paper money for New Jersey. Thereupon Franklin contrived a copper-plate press for this job—the first that had been seen in the country—and cut the ornaments for the bills. Meantime Franklin, with one of the apprentices, had ordered a press and types from London, that they two might set up an independent office. Shortly after the New Jersey job was finished, these materials arrived in Philadelphia, and Franklin immediately opened his own printing office. His partner 'was, however, no compositor, a poor pressman, and seldom sober.' The office prospered, and in July, 1730, when Franklin was twenty-four years old, the partnership was dissolved, and Franklin was at the head of a well-established and profit-

able printing business. This business was the foundation of Franklin's fortune; and better foundation no man could desire. His industry was extraordinary. Contrary to the current opinion, Dr. Baird of St. Andrews testified that the new printing office would succeed, 'for the industry of that Franklin,' he said, 'is superior to anything I ever saw of the kind; I see him still at work when I go home from the club, and he is at work again before the neighbors are out of bed.' No trade rules or customs limited or levied toll on his productiveness. He speedily became by far the most successful printer in all the colonies, and in twenty years was able to retire from active business with a competency.

One would, however, get a wrong impression of Franklin's career as a printer, if he failed to observe that from his boyhood Franklin constantly used his connection with a printing office to facilitate his remarkable work as an author, editor and publisher. Even while he was an apprentice to his brother James he succeeded in getting issued from his brother's press ballads and newspaper articles of which he was the anonymous author. When he had a press of his own he used it for publishing a newspaper, an almanac and numerous essays composed or compiled by himself. His genius as a writer supported his skill and industry as a printer.

The second part of the double subject assigned to me is Franklin as philosopher. The philosophy he taught and illustrated related to four perennial subjects of human interest: education, natural science, politics and morals. I propose to deal in that order with these four topics.

Franklin's philosophy of education was elaborated as he grew up, and was applied to himself throughout his life. In the first place, he had no regular education of the usual sort. He studied and read with an extraordinary diligence from his earliest years; but he studied only the subjects which attracted him, or which he himself believed would be good for him, and throughout life he pursued only those inquiries for pursuing which he found within himself an adequate motive. The most important element in his training was reading, for which he had a precocious desire, which was imperative and proved to be lasting. His opportunities to get books were scanty; but he seized on all such opportunities, and fortunately he early came upon the 'Pilgrim's Progress,' the *Spectator,* Plutarch, Xenophon's 'Memorabilia,' and Locke 'On the Human Understanding.' Practise of English composition was the next agency in Franklin's education; and his method—quite of his own invention—was certainly an admirable one. He would make brief notes of the thoughts contained in a good piece of writing, and lay these notes aside for several days; then, without looking at the book, he would endeavor to express these thoughts in his own words as fully as they had been expressed in the original paper. Lastly, he would compare his product with the original, thus discovering his shortcomings and errors. To improve his vocabulary he turned specimens of prose into verse, and later, when he had forgotten the original, turned the verse back again into prose. This exercise enlarged his vocabulary and his acquaintance with synonyms and their different shades of meaning, and showed him how he could twist phrases and sentences about. His times for such exercises and for reading were at night after work, before work in the morning, and on Sundays. This severe training he imposed on himself; and he was well advanced in it before he was sixteen years of age. His memory and his imagination must both have served him well; for he not only acquired a style fit for narrative, exposition or argument, but also

learned to use the fable, parable, paraphrase, proverb and dialogue. Thirdly, he began very early, while he was still a young boy, to put all he had learned to use in writing for publication. When he was but nineteen years old he wrote and published in London 'A Dissertation on Liberty and Necessity, Pleasure and Pain.' In after years he was not proud of this pamphlet; but it was, nevertheless, a remarkable production for a youth of nineteen. So soon as he was able to establish a newspaper in Philadelphia he wrote for it with great spirit and in a style at once accurate, concise and attractive, making immediate application of his reading and of the conversation of intelligent acquaintances on both sides of the ocean. His fourth principle of education was that it should continue through life, and should make use of the social instincts. To that end he thought that friends and acquaintances might fitly band together in a systematic endeavor after mutual improvement. The Junto was created as a school of philosophy, morality and politics; and this purpose it actually served for many years. Some of the questions read at every meeting of the Junto, with a pause after each one, would be curiously opportune in such a society at the present day. For example, No. 5, 'Have you lately heard how any present rich man, here or elsewhere, got his estate?' And No. 6, 'Do you know of a fellow-citizen * * * who has lately committed an error proper for us to be warned against and avoid?' When a new member was initiated he was asked, among other questions, the following: 'Do you think any person ought to be harmed in his body, name or goods for mere speculative opinions or his external way of worship?' and again, 'Do you love truth for truth's sake, and will you endeavor impartially to find, receive it yourself, and communicate it to others?' The Junto helped to educate Franklin, and he helped greatly to train all its members.

The nature of Franklin's own education accounts for many of his opinions on the general subject. Thus, he believed, contrary to the judgment of his time, that Latin and Greek were not essential subjects in a liberal education, and that mathematics, in which he never excelled, did not deserve the place it held. He believed that any one who had acquired a command of good English could learn any other modern language that he really needed when he needed it; and this faith he illustrated in his own person, for he learnt French, when he needed it, sufficiently well to enable him to exercise great influence for many years at the French court. As the fruit of his education he exhibited a clear, pungent, persuasive English style both in writing and in conversation—a style which gave him great and lasting influence among men. It is easy to say that such a training as Franklin's is suitable only for genius. Be that as it may, Franklin's philosophy of education certainly tells in favor of liberty for the individual in his choice of studies, and teaches that a desire for good reading and a capacity to write well are two very important fruits of any liberal culture. It was all at the service of his successor Jefferson, the founder of the University of Virginia.

Franklin's studies in natural philosophy are characterized by remarkable directness, patience and inventiveness, absolute candor in seeking the truth, and a powerful scientific imagination. What has been usually considered his first discovery was the now familiar fact that northeast storms on the Atlantic coast begin to leeward. The Pennsylvania fireplace he invented was an ingenious application to the warming and ventilating of an apartment of the laws that regulate the movement of hot air. At the age of forty-one he became interested

in the subject of electricity, and with the aid of many friends and acquaintances pursued the subject for four years, with no thought about personal credit for inventing either theories or processes, but simply with delight in experimentation and in efforts to explain the phenomena he observed. His kite experiment to prove lightning to be an electrical phenomenon very possibly did not really draw lightning from the cloud; but it supplied evidence of electrical energy in the atmosphere which went far to prove that lightning was an electrical discharge. The sagacity of Franklin's scientific inquiries is well illustrated by his notes on colds and their causes. He maintains that influenzas usually classed as colds do not arise, as a rule, from either cold or dampness. He points out that savages and sailors, who are often wet, do not catch cold, and that the disease called a cold is not taken by swimming. He maintained that people who live in the forest, in open barns, or with open windows, do not catch cold, and that the disease called a cold is generally caused by impure air, lack of exercise or overeating. He came to the conclusion that influenzas and colds are contagious—a doctrine which, a century and a half later, was proved, through the advance of bacteriological science, to be sound. The following sentence exhibits remarkable insight, considering the state of medical art at that time: "I have long been satisfied from observation, that besides the general colds now termed influenzas (which may possibly spread by contagion, as well as by a particular quality of the air), people often catch cold from one another when shut up together in close rooms and coaches, and when sitting near and conversing so as to breathe in each other's transpiration; the disorder being in a certain state." In the light of present knowledge what a cautious and exact statement is that!

There being no learned society in all America at the time, Franklin's scientific experiments were almost all recorded in letters written to interested friends; and he was never in any haste to write these letters. He never took a patent on any of his inventions, and made no effort either to get a profit from them, or to establish any sort of intellectual proprietorship in his experiments and speculations. One of his English correspondents, Mr. Collinson, published in 1751 a number of Franklin's letters to him in a pamphlet called 'New Experiments and Observations in Electricity made at Philadelphia in America.' This pamphlet was translated into several European languages, and established over the continent—particularly in France—Franklin's reputation as a natural philosopher. A great variety of phenomena engaged his attention, such as phosphorescence in sea water, the cause of the saltness of the sea, the form and the temperatures of the Gulf Stream, the effect of oil in stilling waves, and the cause of smoky chimneys. Franklin also reflected and wrote on many topics which are now classified under the head of political economy,—such as paper currency, national wealth, free trade, the slave trade, the effects of luxury and idleness, and the misery and destruction caused by war. Not even his caustic wit could adequately convey in words his contempt and abhorrence for war as a mode of settling questions arising between nations. He condensed his opinions on that subject into the epigram: 'There never was a good war or a bad peace.'

Franklin's political philosophy may all be summed up in seven words—first freedom, then public happiness and comfort. The spirit of liberty was born in him. He resented his brother's blows when he was an apprentice, and escaped from them. As a mere boy he refused to attend church on Sundays in accordance with the custom of

his family and his town, and devoted his Sundays to reading and study. In practising his trade he claimed and diligently sought complete freedom. In public and private business alike he tried to induce people to take any action desired of them by presenting to them a motive they could understand and feel—a motive which acted on their own wills and excited their hopes. This is the only method possible under a régime of liberty. A perfect illustration of his practise in this respect is found in his successful provision of one hundred and fifty four-horse wagons for Braddock's force, when it was detained on its march from Annapolis to western Pennsylvania by the lack of wagons. The military method would have been to seize horses, wagons and drivers wherever found. Franklin persuaded Braddock, instead of using force, to allow him (Franklin) to offer a good hire for horses, wagons and drivers, and proper compensation for the equipment in case of loss. By this appeal to the frontier farmers of Pennsylvania he secured in two weeks all the transportation required. To defend public order Franklin was perfectly ready to use public force, as, for instance, when he raised and commanded a regiment of militia to defend the northwestern frontier from the Indians after Braddock's defeat, and again when it became necessary to defend Philadelphia from a large body of frontiersmen who had lynched a considerable number of friendly Indians, and were bent on revolutionizing the Quaker government. But his abhorrence of all war was based on the facts, first, that during war the law must be silent, and secondly, that military discipline, which is essential for effective fighting, annihilates individual liberty. "Those," he said, "who would give up essential liberty for the sake of a little temporary safety deserve neither liberty nor safety." The foundation of his firm resistance on behalf of the colonies to the English Parliament was his impregnable conviction that the love of liberty was the ruling passion of the people of the colonies. In 1766 he said of the American people: "Every act of oppression will sour their tempers, lessen greatly, if not annihilate, the profits of your commerce with them, and hasten their final revolt; for the seeds of liberty are universally found there, and nothing can eradicate them." Because they loved liberty, they would not be taxed without representation; they would not have soldiers quartered on them, or their governors made independent of the people in regard to their salaries; or their ports closed, or their commerce regulated by Parliament. It is interesting to observe how Franklin's experiments and speculations in natural science often had a favorable influence on freedom of thought. His studies in economics had a strong tendency in that direction. His views about religious toleration were founded on his intense faith in civil liberty; and even his demonstration that lightning was an electrical phenomenon brought deliverance for mankind from an ancient terror. It removed from the domain of the supernatural a manifestation of formidable power that had been supposed to be a weapon of the arbitrary gods; and since it increased man's power over nature, it increased his freedom.

This faith in freedom was fully developed in Franklin long before the American Revolution and the French Revolution made the fundamental principles of liberty familiar to civilized mankind. His views concerning civil liberty were even more remarkable for his time than his views concerning religious liberty; but they were not developed in a passionate nature inspired by an enthusiastic idealism. He was the very embodiment of common sense, moderation and sober honesty. His standard of human society is perfectly expressed in the

description of New England which he wrote in 1772: "I thought often of the happiness in New England, where every man is a freeholder, has a vote in public affairs, lives in a tidy, warm house, has plenty of good food and fuel, with whole clothes from head to foot, the manufacture perhaps of his own family. Long may they continue in this situation!" Such was Franklin's conception of a free and happy people. Such was his political philosophy.

The moral philosophy of Franklin consisted almost exclusively in the inculcation of certain very practical and unimaginative virtues, such as temperance, frugality, industry, moderation, cleanliness and tranquility. Sincerity and justice, and resolution—that indispensable fly-wheel of virtuous habit—are found in his table of virtues; but all his moral precepts seem to be based on observation and experience of life, and to express his convictions concerning what is profitable, prudent, and on the whole satisfactory in the life that now is. His philosophy is a guide of life, because it searches out virtues, and so provides the means of expelling vices. It may reasonably determine conduct. It did determine Franklin's conduct to a remarkable degree, and has had a prodigious influence for good on his countrymen and on civilized mankind. Nevertheless, it omits all consideration of the prime motive power, which must impel to right conduct, as fire supplies the power which actuates the engine. That motive power is pure, unselfish love—love to God and love to man. "Thou shalt love the Lord thy God with all thy heart * * * and thy neighbor as thyself."

Franklin never seems to have perceived that the supreme tests of civilization are the tender and honorable treatment of women as equals, and the sanctity of home life. There was one primary virtue on his list which he did not always practise. His failures in this respect diminished his influence for good among his contemporaries, and must always qualify the admiration with which mankind will regard him as a moral philosopher and an exhorter to a good life. His sagacity, intellectual force, versatility, originality, firmness, fortunate period of service, and longevity combined to make him a great leader of his people. In American public affairs the generation of wise leaders next to his own felt for him high admiration and respect; and the strong republic, whose birth and youthful growth he witnessed, will carry down his fame as political philosopher, patriot and apostle of liberty through long generations.

CHARLES W. ELIOT.

AN EMPIRICAL STUDY OF COLLEGE ENTRANCE EXAMINATIONS.

EVERY one who is acquainted with the present arrangements for admission to college through entrance examinations recognizes the need for accurate information concerning the exact function served by them. The expenditure of energy by students and teachers in the course of specific preparation for these examinations, by students and their parents in worry before and after, by college admission boards in preparing, giving, scoring and recording such examinations is obvious. The opinions of supposedly equally competent observers range from certainty that such examinations have no correspondence with intellectual merit to equal certainty that they are a reliable measure of fitness for college and a chief safeguard of the standards of collegiate work. The practises of the fifty most efficient colleges in the country vary from a practically absolute requirement of such examinations as the condition of entrance to the freshman year to an exemption of almost every candidate from any such examination.

The present report will not offer any opinions concerning the general rationality

of the arrangements for entrance to American colleges, but will give without comment or inferences the facts concerning the actual significance of a student's achievement in entrance for his later achievement in college work, and also certain facts of importance concerning the entrance marks themselves.

I have recorded the entire entrance record and the entire college record through 1905 of every student entering Columbia College in 1901, 1902 and 1903 who took in whole or in part the entrance examinations given by the College Entrance Board of the Association of Colleges and Preparatory Schools of the Middle States and Maryland. These facts enable one to measure precisely enough for all practical purposes the relationship between success in the entrance examinations (in any one or in any combination of subjects) and success in college (in any one subject or year or combination of subjects or of years).

I shall, for the sake of brevity, refer here only to the 130 students for whom I have complete records through junior year. For each of these I have such a record as the following:

INDIVIDUAL X.

Entrance.

	Credited.
English: Reading,	
Study,	80
Latin: Grammar,	62.5
Composition,	60
Cicero,	62.5
Vergil,	95
Sight Translation,	95
Greek: Grammar,	73
Composition,	75
Xenophon,	73
Homer,	90
French: Elementary,	78
Mathematics: Algebra to Quadratics,	100
Quadratics,	100
Plane Geometry,	97

College.

Freshman: English,	C
Latin,	D
Mathematics,	B
German,	C
Physics,	D
Sophomore: English,	C and D
Latin,	B
Mathematics,	C
History,	C
Physics,	C
Junior: English,	D and C
German,	F
Economics,	F
History,	A and B

In transmuting the A, B, C records into more convenient quantities I have taken A = 6, B = 4, C = 3, D = 1 and F = 0. Perhaps A = 10, B = 7, C = 5, D = 2 and F = 0 would be a trifle closer to the real values of these conventional measures of relative position. The entrance scores have been used in their original form. The use of marks given in the conventional way by examiners or instructors as measures of either quantity of ability or relative position in comparison with other students is a matter involving many complex and delicate questions of statistical method. A too naïve procedure may introduce variable and constant errors of considerable moment. It would take too long to defend the author's methods and would interest only the critical student of mental measurements. Suffice it to say that the author is cognizant of the problems and will state no result which would have been essentially changed by the adoption of any rational method of treating the marks.

The most important question is, of course, the general relation between standing in entrance examinations and standing in college work. The facts are given in Tables I., II., III. and IV. The relationship is only moderate even in the case of the work of freshman year and dwindles steadily, the coefficients of correlation be-

ing in order .62, .50, .47 and .25. An examination of the tables and individual records reveals such facts as the following:

Tables I., II., III. and IV. show for each individual the relation between entrance standing and college standing. Horizontal position denotes the rank in entrance (the median of the highest eleven marks obtained); vertical position denotes the rank in college studies (the average of the five highest marks obtained—in senior year in Table I., in junior year in Table II., etc. Each figure entered in the table means so many students. Thus in Table I. the 1 at the upper left-hand corner means that one student scoring 60 in entrance scored 4 in the college work of senior year. The other 1 in the same column means that one student scoring 60 in entrance scored 21 in college work. The 1 in the next vertical column means that one student scoring 61 in entrance, scored 24 in college work. The vertical column under 70 would read:—Of 10 students each ranking

TABLE I.

Entrance Mark.

Mark of Senior Year.	60	65	70	75	80	85	90	95
4	1							
5								
6								
7								
8								
9								
10							1	
11								
12								
13								
14								
15		1	1	1				
16			1	1 1				
17					2			
18			4		1			
19			1		1 1		1	
20		1		1	1 1		1	
21	1		1	1 1	1	1		
22		1	1	1	1	1		
23								
24		1 1		2				
25				1				
26					1 1			
27			1					
28			1		1		1	
29								
30			1	3	1 3			1

TABLE II.

Entrance Mark.

Mark of Junior Year.	60	65	70	75	80	85	90	9
6	1							
7				1				
8								
9				1 1				
10		1	1					
11			2	2	1			
12								
13		1 1	1				1	
14			1 1	1				
15	1			1	1			
16		1 1	1 1	2 1	1 1			
17				1	3 1			
18		1 1	1		1 1	1		
19	1			4	3	1 1		
20		2 1	3 1	1 1	2	1	1	
21			1	1	1 2		1	
22		1 1		1 3	1 1	1 2	1	
23								
24		1	3	1	1 2	1	1	
25					1	1	1	
26			1	1			1	
27								
28	1			3	3	2 1 1		1
29								
30	1		1 1		1 1 1	1	2 1	1

TABLE III.

Entrance Mark.

Mark of Sophomore Year.	60	65	70	75	80	85	90	95
1		1	1 1					
2								
3								
4				1				
5			1 1					
6								
7			2		1			
8	1		1	1		1		
9		1		2	2			
10	1		1 2	1				
11		1		2				
12			1 1		1			
13		1	1 1	1 1	1		1	
14	1	1 1	3					
15		1	1 1 5	1 1				
16		1	1 2	1	1	1	1	
17		1	2	1				1
18	1 1		3 1	1 1	1 4	1	1	
19			1 1	3	2 1		1 1	
20		1	2 1		2 4			
21		1 1	2		1			
22			1	1	1 2 1	1	1	
23	1			2				
24			2	2	1 2		1 1	
25				1	1			
26				1	3 1	4	2	
27		1						
28	1			1 1		1	1 1 1	
29								
30			1				1 2	1 1

TABLE IV.

Entrance Mark.

Mark of Freshman Year.	60	65	70	75	80	85	90	95
3								
4	1	1						
5		1	1					
6		1	2 1	2				
7			1	1				
8				1		1		
9	1	1		2	1	1		
10				3	1	1		
11	1 1	1 1		1 1				
12	1 1		1 6		1	1 1		1
13		1	1 1 3	1 1				
14	1 1	2	3 1	1 2			1	1
15	1		2	1	2 1	2 1		
16		1	2	1 1	1	1	2	
17		2	2	1 2	1	2 1		
18	1		1		1 1 1	4 1		1
19			1		2	1 3 1		
20		1	2 2		1 3		2 1 1	
21		1	1 1 1	2 1	3	1		
22	1 1		1		1	1		1
23			1		1 2		1	1
24				1		1 2	1	1
25								
26			1	1		1	1 1	1
27					1			
28					1		1	1
29								
30							1	2 1 1

70 in entrance examinations, one ranked 15 in the college work of senior year, one 16, four 18, one 19, one 21, one 22 and one 27.

The values 60, 61, 62, etc., up to 95 of the horizontal scale are directly obtained from the entrance marks which are given on the ordinary scale of from 100 down. The values 4, 5, 6 up to 30 of the vertical scale are obtained from the college records of A, B, C, D and F by taking A = 6, B = 4, C = 3, D = 1 and F = 0. Thus 30 = five A's, 28 = four A's and one B, 27 = four A's and one C, 26 = three A's and two B's, 25 = three A's, one B and one C, or four A's and one D, etc.

Six students out of the 130 received the same average entrance mark, 61. In their college work of junior year one averaged a trifle above D, one half way from D to C, one a little above C, and two received A in four subjects out of five and B in the other. In freshman and sophomore year the range was nearly as great.

Eleven students of the 130 received in the entrance examinations marks averaging 70 in each case. In their college work of junior year they averaged all the way from D to A.

Of the students who were in the lower half of the group in the entrance examinations nearly forty per cent. are found in the upper half in the last three years of college.

Of the dozen students who ranked highest in entrance, some were in the lowest fifth of the class by junior year.

If, knowing that 50 individuals ranked in the order Jones, Smith, Brown, etc., in their entrance marks, one were to wager that in the college work of, say, junior year, they would rank Jones, Smith, Brown, etc., as before, he would lose his bet in 47 cases out of the 50.

The record of eleven or more entrance examinations gives a less accurate prophecy of what a student will do in the latter half of his college course than does the college record of his brother! The correlation between brothers in intellectual ability is approximately .40, but that between standing in entrance examinations and standing in college is only .47 for junior year and .25 for senior year.

The lack of perfect correlation between standing in entrance examinations and standing in, say, junior year of college is presumably due to several causes. First, the relative standing of a boy among his fellows in any mental capacity or combination of capacities varies from year to year. That is, the correlation between John's condition in 1900 and John's condition in 1903 is not perfect. In the second place, the standing in entrance does not even ostensibly measure the same capacities as does his standing in junior year. This accounts for part of the lack of correlation because there is a general departure from perfect correlation amongst different capacities in the same individual, for instance between mathematics and the rhetorical gifts. In the third place, the entrance record is not a perfect measure of the capacities it ostensibly measures. Hence the relation of the two facts, entrance mark and college mark, is not so close as the relation between entrance ability and college ability would be.

This analysis is of no significance so far as concerns the adequacy of the entrance examinations as a test of fitness for college, but it is important when such facts as those presented here are used in reasoning about the general problems of individual and genetic psychology.

It is possible from the data to answer the question, "Of the examinations in the different entrance subjects, which is most prophetic of an individual's success in college work?" The author hopes to make the necessary calculations when he has 150 or more records complete through senior year. A rough treatment of the facts in the case of English, Latin, mathematics and science shows no impressive differ-

ences; so far as the facts go they show a slight advantage in favor of the science examinations and a slight inferiority of the mathematics examination. The facts are given in Table V.

The reliability of any one single examination mark from the dozen or more given as the test for entrance is practically important because the disrepute into which entrance examinations have fallen in the opinion of high school teachers is largely due to the failure in some examination of a pupil known to be of first-rate ability in the subject. I give in Table VI. the facts concerning the relation of the entrance mark in Vergil of one class to achievement in college Latin courses as a sample. The correlation as calculated is almost zero.

It is the opinion of many sagacious observers that one defect of the traditional entrance examinations is that they measure the cleverness of the student's coaching rather than his own fundamental capacities. This hypothesis as it stands can not be tested by my records without the additional knowledge of the cleverness of each candidate's coaching. But the general fact that the entrance examinations do not measure at all accurately the candidate's capacity can be demonstrated from two lines of evidence—the great variability of the marks of the same individuals in different special branches of the same subject (such as—Vergil and Cicero in Latin) and in precisely the same subject, in the case of examinations repeated because of initial failure.

TABLE V.

Class of 1905. Correlation of Separate Entrance-Subjects with College Work.

	Latin		English and History		Mathematics		Science	
	Entrance	N.	Entrance	N.	Entrance	N.	Entrance	N.
Freshman marks,	.31	(80)	.43	(84)	.48	(84)	.84	(34)
Sophomore marks,	.40	(73)	.43	(77)	.19	(77)	.73	(33)
Junior marks,	.43	(66)	.51	(68)	.28	(68)	.43	(28)
Senior marks,	.59	(56)	.25	(56)	.22	(56)	.19	(23)
Average,	.43		.40		.30		.55	

TABLE VI.

Class of 1901. Correlation between Entrance Mark in Vergil and College Work in Latin.

Entrance Mark in Vergil.

College Work in Latin.	31	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90
F											1			1															
D																2	1	1	1	1						1			
C D D								1																1					
C C D																1													
C C C														2		2	1	2	3	1	2	1	3	2	1	3			1
B C															1	1													
B	1													4	1	1			1		1		2			4			1
A B C																			1				1						
A B																		1											
A				1												1			1		1	1							

TABLE VII.

Range of Difference of the Same Individual's Separate Entrance Marks in Latin. Only last trials used. Class of 1905.

Amount of Difference.	Frequency.	Amount of Difference.	Frequency.
0– 4	1	40–44	3
5– 9	2	45–49	3
10–14	10	50–54	3
15–19	16	55–59	2
20–24	11	60–64	4
25–29	6	65–69	3
30–34	8	70–74	3
35–39	8	75–79	1

The average range of difference of the

TABLE VIII.

Difference between First and Last Trials of an Entrance Examination. Class of 1906.

Number of Points Difference.	Frequency.	Frequency in English Examinations.	Frequency in Latin Examinations.	Frequency in French Examinations.	Frequency in Mathematics Examinations.
0	2		1		1
1					
2	2	1			1
3	3		1		2
4	2			1	1
5	3	1		2	
6	3	1		1	1
7	4	1		2	1
8	2	1			1
9					
10	9	3	4		2
11	3		1	2	
12	2			1	1
13	2	1	1		
14					
15	8	3	3	1	1
16					
17	3		2	1	
18	2	1			1
19	5	2		2	1
20	5	2	3		
21	2				2
22	3		1		2
23	1				1
24	1	1			
25	7	1	6		
26	1	1			
27	2			1	1
28	4			2	2
29	2			1	1
30	8		3	3	2
31	1				1
32	2			1	1
33	3			1	2
34	2		2		
35	5		4		1
36	4	1	1	1	1
37	4	1	3		
38	4	1	1	2	
39	1			1	
40	5	1	1		3
40–49	10		3	3	4
50–59	5	3	1		1
60–69	3				3

marks of an individual's separate examinations in Latin, for instance, was over 30 in the case of the class of 1901, the distribution of these differences being given in Table VII. (the scale of marking being always the common one from 100 down).

In 140 cases of repeated examinations chosen at random the average difference between a candidate's first and his second trial of precisely the same examination was over 22, the distribution of these differences being given in Table VIII.

It should be noted that this defect (not measuring capacity) of the examinations of the Middle States Board probably exists to a greater extent with the examinations given independently by single colleges, for in the former case the examination questions are planned and the papers rated with great care. The eccentricities of individual examiners play a relatively minor rôle, and the nature of the examination can probably not be prophesied in advance so accurately as in the case of the examinations arranged by some one college.

The inaccuracy of prophecy of achievement in college from achievement in entrance examinations becomes intolerable in individual cases. For instance, there were 10 men out of the 130 who in their junior year got A (the highest mark given) in at least five studies. Their average marks at entrance were in some cases in the lowest tenth of the 130, barely above the passing mark. Had the passing mark been set the least bit higher, one of the very best students of the three college classes would have been debarred from entrance. There is every reason to believe that of those students who did yet worse in the entrance examinations and so were shut out, a fairly large percentage would have done better in college than a third of those who were admitted. Sooner or later some one will be barred out who would have been the best man of his class.

The inferences concerning the inadequacy of the traditional entrance examinations as tests of merit and their great injustice in many individual cases are too obvious to need comment. The author's suggestions for the improvement of the conditions of entrance to eastern colleges have been stated briefly in the *Educational Review* for May, 1906.[1] In place of any practical suggestions I may be allowed to call attention to the general problem of which the college-entrance problem is but one particular instance.

The whole matter of the means of selecting students for continued education is in great need of scientific study. Pupils are eliminated from special forms of education and from formal education of any sort at all ages and by all sorts of arbitrary selective agencies, some permitted and others deliberately created by our educational system. The traditional college entrance examination is but one of a hundred agencies that decide which individuals shall progress to a given kind of educational opportunity.

In an ideal system these agencies would secure to each individual continued education to such extent and in such directions as would be for the greatest welfare of the most deserving. Under present conditions they are at times administered to suit the personal convenience of school principals, college faculties and the like, and are almost always administered without the guidance of scientific knowledge. It is the duty of scientific men to apply the same methods of thought to this question of social policy that they would demand in their special science.

EDWARD L. THORNDIKE.
TEACHERS COLLEGE,
COLUMBIA UNIVERSITY.

[1] The gist of these was the recommendation that schools be credited on the basis in each case of a systematic record of the actual success *in college* of candidates endorsed in the past by the school, the records of success in college being sent in from all colleges to some central board.

SCIENTIFIC BOOKS.

Methods of Organic Analysis. By HENRY C. SHERMAN, Ph.D., Adjunct Professor of Analytical Chemistry in Columbia University. New York, The Macmillan Co. 1905.

In this volume of 240 pages is comprised a very considerable amount of information regarding methods of proximate organic analysis. An idea of the scope of the work may be gained from an enumeration of the topics treated. Methods of ultimate organic analysis, analysis of ash, the determination of the nitrogen, sulphur and phosphorus of organic compounds, are first taken up. This preliminary treatment is followed by descriptions in considerable detail of selected methods for the estimation and examination of such classes of organic bodies as alcohols, aldehydes, carbohydrates, acids, oils, soaps, proteids and milk. Special prominence is given to processes bearing on food analysis.

Commendable features are: the free use of references, in the form of both foot-notes and bibliographical compilations; the carefully worked-out procedures; the clear and pertinent notes and discussions. The isolated student or casual worker in methods of organic analysis will find the book of especial value in pointing out original and often scattered sources of information.

Naturally there are some particulars in which every chemist would not coincide with the author's experience or conclusions. Such, for example, are the rather unsatisfactory methods described for the detection of borates and of fluorides on pages 232 and 233, and the summary way in which the two common methods for estimating fusel oil are dismissed as equally unsatisfactory (p. 35). It would have been of interest to food analysts, especially, to have had something from the author's experience with either of these two methods. Such minor points, however, de-

tract nothing from the general excellence of the book, of which it is, perhaps, sufficient to say that it is in keeping with what would be expected from one of Professor Sherman's high rank as a teacher and investigator in this field of analytical chemistry.

The mechanical part of the work is well done, the book being of convenient size, well printed and bound. Personal experience with the index for several months has shown that for the practical purposes of an index it leaves much to be desired. A. G. Woodman.

SCIENTIFIC JOURNALS AND ARTICLES.

THE AMERICAN JOURNAL OF ANATOMY.

At a meeting of the board of editors of the *American Journal of Anatomy* on April 18, 1906, Dr. Lewellys F. Barker resigned, and Dr. Charles R. Bardeen, professor of anatomy at the University of Wisconsin, and Dr. Henry H. Donaldson, professor of neurology of the Wistar Institute, were elected editors.

The contents of Vol. V., No. 2, May, 1906, are as follows:

Ross G. Harrison: 'Further Experiments on the Development of Peripheral Nerves.' With five figures.

Albert C. Eycleshymer and J. M. Wilson: 'The Gastrulation and Embryo Formation in Amia Calva.' With four double plates.

C. F. W. McClure: 'A Contribution to the Anatomy and Development of the Venous System of Didelphys Marsupialis (L.)—Part II., Development.' With twenty-seven text figures and five double plates.

Proceedings of the Association of American Anatomists, Nineteenth Session, August 6–10, 1905, and Twentieth Session, December 27–29, 1905.

List of Members of the Association of Anatomists.

SOCIETIES AND ACADEMIES.

SOCIETY FOR EXPERIMENTAL BIOLOGY AND MEDICINE.

The sixteenth meeting of the Society for Experimental Biology and Medicine was held in the new building of the Rockefeller Institute for Medical Research on Wednesday, April 18. The president, Simon Flexner, was in the chair.

Members Present.—Atkinson, Auer, Beebe, Buxton, Calkins, Dunham, Emerson, Field, Flexner, Foster, Gibson, Gies, Herter, Lee, Levene, Lusk, Meltzer, Meyer, Murlin, Noguchi, Opie, Parker,[1] Pratt,[1] Salant, Schwyzer, Sherman, Terry, Wolf, Wood.

Members Elected.—Charles R. Bardeen, G. H. A. Clowes, N. B. Foster, J. H. Kastle, Ralph S. Lillie, D. T. MacDougal, J. J. R. Macleod, Robert M. Yerkes.

Abstracts of Reports of Original Investigations.[2]

On the Digestion of Gelatin: P. A. Levene and W. A. Beatty.

The authors used phosphotungstic acid to effect separation of the amino-acids produced from proteins by hydrolysis. Tryptic digestion of gelatin resulted in the formation of a substance apparently identical with prolinglycyl anhydrid ($C_7H_{10}N_2O_2$).

The Reactions of Amphioxus to Light: G. H. Parker.

When strong light was thrown into a basin of sea-water containing many amphioxus, the whole assembly swam about in wild confusion. This has been taken to indicate that amphioxus is very sensitive to light. But when twenty individuals were illuminated singly only twelve responded. The wild confusion in the first experiment is due quite as much to tactile stimulation as to light. When a strong, well-circumscribed beam of light was thrown on the tail of amphioxus the animal almost always reacted by a slight forward spring. When the light was thrown on the middle of the body there was usually no reaction, though sometimes a backward movement. When the light was applied to the head end, there was always a backward spring. This sensitiveness was not lost or impaired by cut-

[1] Non-resident.

[2] The abstracts presented in this account of the proceedings have been greatly condensed from abstracts given to the secretary by the authors themselves. The latter abstracts of the communications may be found in current numbers of *The Journal of the American Medical Association*, *American Medicine* and the *New York Medical Journal*.

ting off the anterior end, including the so-called eye-spot. When cut into halves, amphioxus retained sensitiveness to light in the anterior half, but not in the posterior half, though the latter was normally reactive to stimulation from very weak acid. This indicates that though amphioxus is without a brain proper, the anterior portion of its medullary tube is related to the posterior portion somewhat as the brain and cord are in the higher vertebrates. The distribution of the sensitiveness of amphioxus to light corresponds to the distribution of the 'light' cells (Hesse) in its medullary tube and is probably not connected with the skin. Specimens of amphioxus tend to collect in the darker parts of an aquarium. They also swim away from a source of light. Amphioxus is, therefore, negatively photodynamic and negatively phototropic.

The Relation of Blood Platelets to Thrombus Formation: JOSEPH H. PRATT.

In frogs and rabbits experimental thrombi three to ten minutes old were studied. In the youngest thrombi there was agglutination of blood platelets or spindle-cells and agglutination of erythrocytes without evidence of fibrin formation. The fusing and distortion of the erythrocytes were marked. The erythrocytes were sometimes broken up into small granular masses which simulated blood plates. By the use of a sodium metaphosphate solution it was possible to distinguish the blood platelets from the degeneration products of the erythrocytes.

On the Conditions of Bacterial Activity in the Intestine in Cases of Advanced, Apparently Primary, Anemias: C. A. HERTER.

The author reported results of the coordinated studies of fifteen cases of apparently primary advanced anemias, in ten of which the blood picture was that of pernicious anemia. The studies related to the occurrence of phenol in the urine and in the feces; of indol in the feces and indican in the urine; of skatol in the feces; to the Ehrlich aldehyde reaction of the urine; to the Ehrlich aldehyde reaction of the feces; and to the hydrobilirubin reaction of Schmidt. In the case of indol, phenol and skatol, quantitative studies were made. The observations established the fact that in so-called primary pernicious and allied anemias the indications of excessive putrefactive decomposition are almost regularly pronounced. These changes are associated with definite and characteristic departures in the bacterial activity of the intestinal flora studied in fermentation tube experiments. A careful study of the microscopical fecal fields, of the sedimentary fields in fermentation tubes, of the anerobic plates from the sterilized feces, and of the results of a modification of Welch's incubation test for the gas-bacillus, indicates that in nearly every instance examined the peculiar Saccharobutyric type of bacterial decomposition here found is dependent upon *B. Welchii* (*B. aerogenes capsulatus*). Evidence is furthermore brought forward to show that this organism is a prominent and perhaps specific factor in advanced 'primary' anemia. The overgrowth of the gas-bacillus is associated with a partial disappearance of *B. coli.* During convalescence the gas-bacillus recedes numerically and *B. coli* resumes a dominant position.

Absorption of Typhoid Bacilli from the Peritoneal Cavity: B. H. BUXTON and J. C. TORREY.

Shortly after injection of typhoid bacilli into the peritoneal cavity of a rabbit the organs in most experiments are found to be invaded by the bacilli, more particularly the liver and spleen, in which there may be enormous numbers. By means of injection of lamp black, the peritoneal path for this rapid rush to the organs is shown to be by way of the anterior mediastinal lymphatic trunks. Even in five minutes after injection the trunks and the anterior mediastinal lymph nodes are markedly blackened.

On plating out the lymph nodes after injection of typhoid bacilli, they are often found to contain many millions of bacilli, and as a general rule if there are many bacilli in the lymph nodes there are also many in the organs.

On the Dicrotic Elevation at Different Points of the Arterial Tree.—A preliminary communication: Percy M. Dawson. (Presented by J. R. Murlin.)

The author has observed considerable local variation of the dicrotic elevation in many arteries in dogs. The pulse wave was studied by means of the Hürthle manometer. The observations were made on numerous arteries. A satisfactory explanation of the local variations observed will be sought through further experimentation.

The Influence of Subcutaneous Injections of Dextrose upon Nitrogenous Metabolism: Frank P. Underhill and Oliver E. Closson.

In experiments with glucose similar to those described by Scott the authors confirmed his observation that nitrogenous metabolism is increased and a greater excretion of oxalic acid results. In no case, however, was there observed a significant change in the proportion of the various forms of excreted nitrogen. The increased proportion of ammonia in the urines of Scott's dogs is attributed by the authors to the fact that most of the animals were suffering from severe cystitis due to catheterization. The authors conclude that subcutaneous injections of large quantities of glucose do not give any evidence of toxic action and they suggest that such injections of glucose may be useful as a method of parenteral feeding, since quantities equal to seven grams per kilo may be thus administered to dogs and rabbits without elimination in the urines of more than mere traces of the sugar.

Diffusion into Colloids and a Biological Method for Testing the Rate of Diffusion: Simon Flexner and Hideyo Noguchi.

The experiments summarized in this report were made with hemolytic substances suspended in isotonic saline solution and in agar-agar and gelatine jelly. The rate of diffusion could be measured by the depth and degree of hemolysis produced in a jelly containing in suspension susceptible red blood corpuscles. The experiments were varied: the red corpuscles were suspended in the warm jelly, which was permitted to congeal. The blood jelly was overlaid with the hemolyzing agent dissolved in saline solution or this agent was also contained within a solidified jelly. The hemolyzer was made to diffuse both downwards and upwards, according as the blood- or hemolyzer-jelly was above or below. Moreover, the hemolyzer was placed in the jelly and made to diffuse upwards into a watery solution, the amount of diffusion being measured by the degree of hemolysis caused by the fluid removed at given intervals. Two factors were always considered: extent or degree of hemolysis, and time.

Acids, alkalies, salts, glucosides and toxine diffuse into 0.9-per-cent. watery NaCl solution more quickly than into a similar solution containing agar-agar and gelatine. This reduction in rapidity of diffusion increases with increase in concentration of the jelly. Ten-per-cent. gelatine exerts a greater inhibition than 2-per-cent. agar-agar, and 25-per-cent. gelatine exerts greater restraint than 10-per-cent. gelatine. The ratio between the rate of diffusion and the concentration of the colloidal suspension is, in the case of gelatine, nearly inversely proportional to the square root of the concentration of the colloid. In the case of agar-agar, with which the possibility of varying the concentration is far less than with gelatine, the inhibitory influence is less marked and does not conform to this rule. Voigtländer's results are applicable to the special case of agar-agar jelly.

The influence of colloids upon the injurious effects produced by bile salts upon the pancreas is due, apparently, to a modification by reduction of the diffusibility of the bile salts, which result diminishes the concentration of the salts brought in contact with the pancreatic tissues in a unit of time.

William J. Gies,
Secretary.

THE AMERICAN CHEMICAL SOCIETY.

NEW YORK SECTION.

The seventh regular meeting of the season was held at the Chemists' Club on Friday, April 6, at 8:40 P.M., Chairman Dr. F. D. Dodge presiding. The following papers were presented:

On a 3-Amino Quinazoline and the Corresponding 3, 3'-Diquinazolyl: M. T. BOGERT and H. A. SEIL.

By condensing 6-nitro acetanthranil with hydrazine hydrate, the authors obtained an amino quinazoline and a diquinazolyl. The same diquinazolyl was prepared by condensing the amino quinazoline with another molecule of the anthranil. The properties of these compounds and of several of their derivatives were described.

The Determination of Rosin in Shellac—second paper: A. C. LANGMUIR.

In the author's first paper published in the *Journal of the Soc. Chem. Ind.*, January 16, 1905, the iodine absorption of shellac under certain specified conditions was taken at 18 per cent. and that of rosin at 228 per cent. A large number of tests during the past year on a great variety of shellacs and rosins confirm the values taken at that time. The Hanns solution may be used in place of the Wiji solution, and the same values hold good. The Hubb solution still advocated by Parry should be abandoned, as its use in the determination of rosin has all the inaccuracies established in the case of fat analysis and to a greater extent.

An Electrical Resistance Furnace for the Measurement of Higher Temperatures with the Optical Pyrometer: ALEXANDER LAMPEN.

The substance under investigation is introduced into a small graphite capsule, which is put in the end of a graphite sliding tube, and this is slipped into a fixed horizontal tube heated in a resistance furnace. The pyrometer is sighted on the capsule through the sliding tube. A rough regulation of the temperature is made by varying the current and the fine regulation by moving the capsule to a hotter or cooler zone of the tube. Temperatures up to 2500° C. can be obtained. Besides melting points of several refractory materials, the following temperatures were determined. Reaction point between C. and SiO_2 about 1615° C. Crystallization temperature of C. Si—between 1900° and 2000° C. Decomposition point of C. Si—between 2200° and 2240° C. Reaction point between C. and CaO about 1725° C.

The Measurement of Temperature in the Formation of Carborundum: S. A. TUCKER and ALEXANDER LAMPEN.

The purpose of this investigation was to determine the temperature for the formation of carborundum, and its decomposition into graphite. The furnace was built on the general plan of a large scale carborundum furnace, and was provided with a graphite tube passing transversely through the core and charge. This tube contained a graphite plug which could be pushed to any desired position in the tube. On running the furnace, the plug is raised to a certain temperature depending upon its position in the tube. For different positions this temperature was determined by an optical pyrometer. After taking down the furnace, measurements were made of the layers of carborundum, graphite, siloxicon, and thus gave the temperature at which these changes take place. It was found as an average that the temperature for the formation of carborundum was 1950° C., and for its discomposition in graphite and silicon 2220° C.

F. H. POUGH,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE ORIGIN OF THE SMALL SAND MOUNDS IN THE GULF COAST COUNTRY.

TO THE EDITOR OF SCIENCE: Allow me to express my assent to Professor R. T. Hill's rejection of some theories recently advanced to explain the origin of the small sand mounds in the gulf coast country. No one who is familiar with the appearance of the mounds formed by uprooted trees would for moment regard the sand mounds in the south as having been produced by such a process. Nor do I believe they can be the product of human industry.

Hill's notes on their geographic occurrence are interesting. Allow me to add some data, which I secured relative to these mounds three years ago, near the little village of Olivia in Calhoun County, Texas. I measured the

diameter and the height of fifty-nine mounds, located on an area of about a hundred acres of ground near Keller's Bay, northwest of Olivia post-office. The land has an elevation of some thirty feet above the water in the bay and consists of clay sediments alternating with some sand. The following table shows the variations of diameters and heights of the mounds measured:

MEASUREMENTS OF FIFTY-NINE MOUNDS NEAR OLIVIA, TEXAS.

Diameter of Mounds, in Feet.	Number of Mounds of Different Sizes.	Average Height of Mounds of Different Sizes, in Inches.
Less than 10	13	2.5
From 11 to 20	14	4.5
" 21 " 30	20	7.0
" 31 " 40	6	10.0
" 41 " 50	3	12.0
" 51 " 60	2	13.0
90	1	18.0
Average 23		Average 4.0

About one third of these mounds thus had a diameter of from twenty-one to thirty feet. About forty-six per cent. had a smaller diameter than this and only twenty-one per cent. had a diameter exceeding thirty feet. The extremes were three feet and ninety feet. Their height ranged from two inches to eighteen inches, and it averaged only a little more than four inches. I noticed that their apparent height was quite deceptive. Measurements invariably fell below my first estimates on this dimension.

Observations on two other features were also made: on the presence of sunken pits on the mounds, and on live anthills. The former increased in frequency with the size of the mounds and the latter decreased. One fifth of the mounds exhibited sunken pits. In most cases there was only one pit on each mound, sometimes there were two, and in one instance there were three. The shape of these pits is irregular, and they have a tendency to occur near the center of the mounds. The anthills, on the contrary, often have a peripheral situation. Of the forty-five mounds noted as having anthills three mounds had two and the others had only one each, thus:

CONDITION OF FIFTY-NINE MOUNDS NEAR OLIVIA, TEXAS.

Diameter of Mounds, in Feet.	Number of Pitted Mounds.	Per Cent. of Pitted Mounds to Total of Each Size.	Number of Mounds with Anthills.	Per Cent. of Mounds with Anthills to Total of Each Size.
10 and less	0	0	14	100
11 to 20	1	7	11	79
21 " 30	4	25	15	75
31 " 40	1	17	4	67
41 " 50	3	100	1	33
51 " 60	2	100	0	0
90	1	100	0	0
Averages.	—	20	—	76
Totals.	12	—	45	—

The clay on which these mounds occur is evidently a lagoon sediment. It is red and greenish-blue and too uniform in texture to be a stream alluvium.

I was informed by several parties that under these mounds the sand continues down for some distance below the surface of the surrounding ground, while the rest of the subsoil is clay. It has also been found that when land with such mounds has been inundated for a rice crop, the water sinks so rapidly through the sand under them, that this land can not be used for such purpose, if the mounds are too numerous.

It seems to me that from what is at present known of these mounds the following views may merit consideration, if we wish to apply the method of multiple hypothesis in their study:

1. Differential settling of coarse and fine sediments, as suggested by Hill. The cause of the localization of such action then requires a separate explanation.

2. The anthill hypothesis. Some of the mounds seem too large to be accounted for in this manner, but my own observations rather support it.

3. The wind-drift hypothesis. The persistent circular form is an objection to this hypothesis, as is also the downward continuation of the sand.

4. Vertical brisk seepage of water under hydrostatic pressure through thin clay strata underlain by water-bearing sands, might re-

sult in the formation of irregular chimneys of sand in such clays. This hypothesis appears to require so exceptional conditions as to be almost irreconcilable with the wide distribution of the mounds. J. A. UDDEN.

AUGUSTANA COLLEGE,
ROCK ISLAND, ILL.,
May 15, 1906.

SPECIAL ARTICLES.

RECENT EARTHQUAKES RECORDED AT ALBANY, N. Y.

UNDER the direction of Dr. John M. Clarke, state geologist, a seismograph has been installed at Albany, N. Y., and was placed in operation early in March, this year. The instrument belongs to the Bosch-Omori horizontal-pendulum type. It is mounted on a concrete pier in the basement of Geological Hall. Special care has been taken to isolate the pier, so far as practicable, and to protect the instrument from artificial disturbances. There are two pendulums which record the north-south and east-west components of motion. The elevation above sea level has not been determined, but it is somewhat less than 100 feet.

Up to April 22, three seismic disturbances had been recorded, one on April 10 and two on April 18, the date of the destructive earthquake at San Francisco.

	East-West Comp.	North-South Comp.
1. April 10, P.M.[1]		
Beginning,	4 29 15	4 29
Beginning principal part,	4 41	4 41
End principal part,	4 46	4 42 30
End,	5 27	4 58
Maximum amplitude,	35 mm.	25 mm.
Period of maximum waves,	24	17
2. April 18, A.M.		
Beginning,	8 21 30	8 21 30
Beginning principal part,	8 32 30	8 33
End principal part,	8 42	8 42
End,	11 05	9 37
Maximum amplitude,	48 mm.	65 mm.
Period of maximum waves,	20	18
3. April 18, P.M.		
Beginning,	7 48 30	7 48
End,	8	7 57
Maximum amplitude,	0.1 mm.	

[1] Eastern standard time.

The multiplying ratio of the pointers was twelve on April 10 and ten on April 18. The period of both pendulums was about 30 s. The instrument has been in good working order since its installation, though on April 10 the east-west pointer (registering north-south component) showed an abnormal displacement due probably to its being in slightly unstable equilibrium. The displacement was coincident in time with the arrival of the larger waves. Again on April 18 (A.M.) the record made by the same pendulum showed a greater amplitude for the maximum wave than that registered by the north-south pendulum, but this was apparently due to the seismic disturbance itself, as the preceding and subsequent waves on the former record were much smaller.

It is interesting to note that the duration of the preliminary tremors was about the same in the earthquake of April 10 and in the larger one of April 18, which, if the former came from the west, as seems probable, would indicate that the two had a common origin.

DAVID H. NEWLAND.

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PARAPHYSES IN THE GENUS GLOMERELLA.

ATKINSON was probably the first investigator to obtain a perfect or ascigerous stage from a species of *Glœosporium*. Stoneman, one of his students, continued this line of investigation, and, as a result of her studies, described a new genus which she called *Gnomoniopsis*, containing five species, one of which was considered doubtful. She did not happen to obtain the ascigerous stage from what was then known as *Glœosporium fructigenum* (*Glomerella rufomaculans*), although she grew it in cultures, but Clinton did about four years afterward, and several other investigators have since, among them being Spaulding and von Schrenk, who changed the name of Stoneman's genus from *Gnomoniopsis* to *Glomerella*.

With the exception of Stoneman's doubtful species, there is no evidence that any of these investigators saw anything suggesting paraphyses. On the contrary, Clinton says in his bulletin on the rots of apples, 'There was no

sign of paraphyses,' and Spaulding and von Schrenk in describing the genus *Glomerella* say that it is 'aparaphysate.'

In some cultures of a *Glœosporium* from guavas the writer obtained an ascigerous stage much like the one described for *Glomerella rufomaculans*. The essential difference noticed at the time was the presence of paraphyses, which *G. rufomaculans* was not supposed to have. The repeated occurrence of paraphyses in the ascigerous stages obtained from *Glœosporiums* and *Colletotrichums*, from other sources besides the guavas, suggested the possibility that *G. rufomaculans* might also be paraphysate. Cultures of this fungus, isolated from a Baldwin apple, produced perithecia containing long, slender paraphyses, apparently identical with those obtained from the other cultures referred to. Besides the paraphyses obtained by means of artificial cultures, others were obtained when conidia of a *Glœosporium* were inoculated into rose canes; they have also been found in perithecia growing naturally in the leaves of a species of *Dracœna*.

In general, the paraphyses from the different sources were long, slender, tapering, and more or less wavy. They were usually more abundant at the time when the asci were developing, but were often present with the mature asci. Like the asci, they were somewhat fugacious.

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CURRENT NOTES ON METEOROLOGY.

KITE-FLYING OVER THE ATLANTIC.

Reference was recently made in these 'Notes' to some of the results of the investigation carried out last summer over the North Atlantic under the direction of Messrs. A. Lawrence Rotch and Teisserenc de Bort. A second report on this expedition is published in *Nature* for March 8 and deals chiefly with the kite results. Mr. H. H. Clayton's study of the data collected in the tropics points to the existence of three strata between sea level and 4,000 meters. The trade, about 1,000 meters in thickness, is damp; usually carries cumulus or strato-cumulus clouds in its upper portion, and varies between north and east in direction. Above the surface trade is a current about 2,000 meters in depth, varying between northeast and northwest, but coming always from a direction to the left of the lower wind when facing it. This second current is very dry, and potentially warm, and its velocity is usually much greater than that of the lower wind. The third stratum begins at a height of about 3,000 meters; comes from a direction between east and south or southwest, being generally from the east in equatorial regions and from the south between latitudes 15° and 30° N.

METEOROLOGISCHE ZEITSCHRIFT.

The numbers for February and March of the *Meteorologische Zeitschrift* contain articles of special interest as follows: 'Cirrus Studien,' a detailed study of cirrus movements, by Professor Klein; 'Der Pulsschlag der Atmosphäre,' by Hann, containing comments on Dr. W. N. Shaw's recent article in *Nature*, December 21, 1905; a very interesting, unique, graphic representation, by S. Zöllner, of the daily insolation in different months and latitudes, undertaken at the suggestion of von Bezold; a summary by Hann of the meteorology of the north polar basin, based on the results of the Nansen expedition; a further study of cirrus, especially of the cirrus cap over cumulus, by M. Möller; a brief discussion of the warm wave of January 20–24 last, in the eastern United States, by Dr. S. Hanzlik.

CLEAN AIR AFTER THUNDERSTORM.

In a recent number of *Nature* (March 22, 1906) Mr. John Aitken notes the effect of a thunderstorm rain in bringing clean air. While making some meteorological observations with his dust-counter on the Eiffel Tower, at Paris, a heavy thunder-shower occurred. Before the rain the number of dust particles was large and showed that the impure air of the city came up in great quantities to the top of the tower. After the shower the number of dust particles was so

far reduced that the air finally became as free from dust as any that Mr. Aitken ever tested on the mountain tops of Switzerland. This increase in purity is ascribed to the 'dragging down' of the upper air to the level of the top of the Eiffel Tower, for the reason that 'rain can not wash the air to anything like that purity.'

KITE-FLYING AT BARBADOS.

The Quarterly Journal of the Royal Meteorological Society, XXXII., 1906, 29–32, contains an account of some kite flights carried out last year at Barbados by C. J. P. Cave, the results having been discussed by W. H. Dines. The humidity traces generally show about 60 per cent. at the surface, rising to 80–90 per cent. at 1,000–2,000 feet, and then falling again in some cases to 50 per cent. or less as the height increases. It is inferred from this that there is some descent of the atmosphere over the region of the smaller West Indian islands in April and May.

RAIN-MAKING IN THE YUKON.

The Toronto News of March 23 contains notice of a contract made by the Yukon Council with one Hatfield, a 'rain-maker,' whereby Hatfield is to receive the sum of $10,000, provided he makes rain to the satisfaction of a board of seven men. If he fails, he is to receive his traveling expenses. Commenting on this matter, the *Ottawa Evening Journal* of March 23 says editorially: "There is no questioning the details * * * as the unique document is on file in the government offices in Dawson."

NOTES.

PHOTOGRAPHS of the aurora borealis, taken by the Russo-Swedish expedition to Spitzbergen in 1899–1900, are reproduced in the *Memoirs of the St. Petersburg Academy of Sciences* (phys. math. class), Vols. XI., XIV., Nos. 9 and 5, 8th series.

THE aquameter, a new instrument for measuring the amount of aqueous vapor in the atmosphere by measuring the reduction of volume produced by the absorption of the water vapor by phosphoric anhydride, is described in the *Quarterly Journal of the Royal Meteorological Society*, XXXII., 1906, 11–13.

R. DEC. WARD.

BOTANICAL NOTES.

AN ALPINE BOTANICAL LABORATORY.

FOR some years an alpine botanical laboratory has been growing from small beginnings into considerable importance on the easterly slope of Pikes Peak, Colorado. The first serious work was done in 1899, although preliminary work and reconnaissances date back half a dozen years further. As finally established, it stands on the southeasterly slope of Engelmann's Canyon, a mile and a half from Manitou, at an altitude of 8,500 feet above the sea. As the altitude of the treeless plains (seven to eight miles away to the eastward) which extend to the foot of the mountains is nearly 6,000 feet, the laboratory is fully 2,500 feet above them, while westward about the same distance the Peak itself rises more than 5,000 feet higher (14,147 feet), far above timber line. The lower mountains and the near-by foothills of the neighborhood afford intermediate altitudes, while marsh and lake vegetation is found in abundance in and about Lake Moraine and the Seven Lakes. The sides of Engelmann's Canyon and its branches are covered with spruce forests and their accompanying vegetation. A hundred feet below the laboratory is the dashing mountain stream, Ruxton Brook, and by its side is the cog-railway from Manitou to the summit of the Peak.

In such surroundings for seven years, Dr. Frederic E. Clements, of the University of Nebraska, has carried on his study of the vegetation of the region. The laboratory proper consists of a single house, large enough to shelter the instruments, apparatus, etc., and if need be, several persons also. More room is needed, but the narrow quarters have not yet seriously inconvenienced those who have worked at the laboratory. Some have taken rooms in the summer cottages in the neighborhood; some have clubbed together and hired a cottage for the summer, taking their meals at the Halfway House, or making

a picnic of it, boarding themselves, while still others have brought their tents and 'camped out.' It is already arranged that eight to ten advanced students in botany are to spend the coming summer at the laboratory, giving their time chiefly to the study of ecological problems.

During these seven seasons Dr. Clements has carried on his own investigations upon those ecological problems which present themselves in mountain regions, and with these he has joined a critical study of the elements of the Colorado forest vegetation. Formal instruction was given during two summers, but for the last few years instruction has been quite informal, and for the most part to graduate college students. Three candidates for the doctor's degree in the University of Nebraska have done the greater part of their field work at this laboratory.

The published results of the laboratory include the following titles by Dr. F. E. Clements: 'Herbaria Formationum Coloradensium,' 1902; 'Nova Ascomycetum Genera Speciesque,' 1902; 'Development and Structure of Vegetation,' 1904; 'Formation and Succession Herbaria,' 1905; 'Research Methods in Ecology,' 1905; 'Cryptogamae Formationum Coloradensium,' 1906; 'Novae Fungorum Species Generaque,' 1906 (in press). And the following by others: 'The Relation of Leaf Structure to Physical Factors,' Dr. E. S. Clements, 1905; 'The Movements of Petals,' Dr. E. P. Hensel, 1905; 'A Study of the Vegetation of the Mesa Region East of Pikes Peak,' Dr. H. L. Shantz, 1906.

The principal problems which are now under investigation are the following:

1. *The Causes for the Dwarfing of Alpine Plants.*—It has already been determined by means of simultaneous readings of light and humidity at three different altitudes that light is not the cause of alpine dwarfing, as commonly supposed, and that this is probably due to differences in humidity. It is hoped to publish the results in detail after the work of the coming summer.

2. *The Origin of Mutants in the Fireweed, Chamaenerium angustifolium.*—This is a problem in experimental evolution to determine whether the many forms of this species arise by variation or mutation.

3. *Studies in Experimental Evolution.*—The method used here is essentially new. Plastic and stable species are moved from their original homes to areas of very different character. The physical conditions of both homes are carefully measured, and the resulting modifications of the plant followed in detail. This work should throw light upon how new forms originate, and also upon the relative importance of adaptation, mutation and variation in the origin of new forms.

4. *The Vegetation of Colorado.*—The study of the development and structure of Colorado vegetation was begun in 1896, and has been carried on continuously since 1899. It is hoped to bring the study to completion after the summer of 1907, and then to publish the results as soon as possible.

The record of the work of this unendowed laboratory, which has not even been subsidized by any institution, is certainly most creditable, and it shows that work of the highest order may be done with an inexpensive plant, and the expenditure of very moderate sums of money. That more might be accomplished with some greater expenditure for apparatus, and an enlargement of the building, is no doubt true, and desirable, and will certainly be realized some day. In the meantime, the economical plan and successful management of this laboratory are to be commended, and should encourage other botanists to like undertakings in similarly interesting regions.

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ROYAL SOCIETY CONVERSAZIONE.[1]

The first of the two annual *conversaziones* of the Royal Society, that confined to men, was held on May 9 in the society's rooms in Burlington House. Guests were received by the president, Lord Rayleigh, O.M., with whom were the treasurer, Mr. A. B. Kempe, and the secretary, Professor J. Larmor.

The exhibits were very numerous, too numerous, indeed, to notice in detail. To a

[1] The London *Times*.

large extent they were rigidly special, confined to certain restricted departments of science, mainly physical. There were a certain number of chemical exhibits, and a few—some of them specially interesting—in the domain of biology. There was much that was fascinating and in some cases almost oppressively suggestive. As might have been expected, Professor Milne was prepared to exhibit some of his remarkably instructive seismograms of the recent earthquakes which have been so numerous and wide-spread. The diagrams which he showed related to the Formosa earthquake of March 16, the Californian earthquake of April 18, and the Columbian earthquake of January 31 of this year. Other similar records were exhibited by the Royal Observatory, Edinburgh, from various parts of the world. Another interesting series of records was that from the Meteorological Office, consisting of charts and diagrams showing some of the physical, meteorological and other results of the National Antarctic Expedition. Many of the exhibits which may be classed as physical were of an optical, spectroscopic and photographic character. Dr. W. Marshall Watts's exhibit of a binocular spectroscope, which might otherwise be described as a spectroscopic opera-glass, by means of which both eyes may be used in spectroscopic work, constituted a new departure. Of special interest in connection with the recent mining disasters in France were the oxygen rescue apparatus and other appliances shown by Messrs. Wallach Brothers, used by the rescue parties at Courrières. It is known as the 'Evertrusty' oxygen apparatus, and an adaptation of it may be used in case of carbonic-oxide poisoning and after inhalation of poisonous fumes, etc. Mr. C. V. Boys's gas calorimeter, a somewhat complicated but ingenious arrangement, must have interested many, as it is the instrument by which London gas is officially tested. From the Solar Physics Observatory at South Kensington came various eclipse photographs, stellar spectra, barometric curves and photographs and diagrams illustrating the work done on the orientation of some British stone circles, also some barometric curves in different parts of the world, which seem to suggest a key to the apparent difference of periods. Some very interesting photographs of the solar corona, taken in Spain on the occasion of the eclipse of August 30, 1905, were shown by the Rev. A. L. Cortie. Another interesting astronomical exhibit, sent by the Royal Astronomical Society, consisted of six remarkably brilliant photographs of the Milky Way, taken in 1905 by Professor Barnard at Mount Wilson, California. The specimens of color photographs and photomicrographs, shown by Mr. Edwin Edser and Mr. Edgar Senior, were wonderfully beautiful specimens of this process.

Another notable exhibit was Mr. W. Duddell's mechanical and electrical phenomena occurring in the telephonic transmission of speech, which was an attempt to show the various phenomena which take place between the transmission and reception of a telephonic message; the difference in the vibrations caused by the sounds of the different vowels was most striking. Worthy of inspection was Professor George Forbes's model of naval gun sight, giving correct elevation for any variations of muzzle velocity, air density and time of flight, as arranged for the six-inch B. L. gun, Mark XI., under construction at Elswick, for trial in H. M. S. *Africa*. Mr. W. Rosenhain's improved metallurgical microscope, of somewhat complicated construction, is likely to be of practical value, as also Sir James Dewar's metallic jacketed vacuum vessels, filled with liquid air, the vacuum being produced by the use of cooled charcoal. The series of picrates of Dr. Silberrad and Mr. Phillips was of interest as the salts of picric acid have been the probable cause of some of the most disastrous lyddite explosions on record. Many of the specimens exhibited were in many cases prepared in the course of exhaustive investigations recently carried out at the research laboratories of the Royal Arsenal. Mr. E. G. Rivers's new electric heater deserves attention as an entire departure from the principle of construction usually adopted, the object being to secure a large heating surface at a moderate temperature. Sir Oliver Lodge and Dr. Alexander Muirhead

exhibited a portable pack-transport 'wireless' telegraphy apparatus for military field purposes, available for communications across country up to 50 miles, or 150 miles over sea. Perhaps one of the most important exhibits, from both a scientific and a practical point of view, was Dr. P. E. Shaw's electrical measuring instrument. This machine gets rid of several objections to those ordinarily in use. From the director of the Imperial Institute came a large and varied exhibit which may be taken as a substantial evidence of the useful practical as well as scientific work which is being done under Professor Wyndham Dunstan's direction. The exhibit included a variety of new and rare minerals from Ceylon and several minerals from Canada, as also specimens of cyanogenetic plants, illustrating an investigation which has been conducted by Professor Dunstan and Dr. T. A. Henry, to throw light on the origin of the prussic acid which is produced by certain plants.

As usual, from the Marine Biological Association came quite an interesting exhibit, consisting of a small collection of living fishes from the shore and from shallow water, to illustrate the differences in habit and mode of life adopted by different species. Mr. J. Stanley Gardiner showed some of the many valuable results obtained by his recent very successful expedition for the investigation of the Indian Ocean. These consisted of photographs illustrative of the vegetation of the Seychelles Islands, and some rocks dredged off Providence Coral Reef, 844 fathoms. From the director of Kew Gardens came an attractive exhibit in the shape of some specimens showing the precocious flowering of plants, and some exalbuminous grass seeds. The exhibit by Mr. J. E. S. Moore and Mr. C. E. Walker, showing recent researches in cell-division, was evidence of the good work which continues to be done at Liverpool University. Two of the most notable, attractive and suggestive exhibits were Mr. K. A. Tarrant's photographs of electric discharges and Dr. Albert A. Gray's spectroscopic photographs of the membranous labyrinth of the ear in different animals. There were many other exhibits of solid scientific interest, but we have only space to refer to the varied specimens of work from the National Physical Laboratory, including a great variety of photomicrographs, an apparatus for the test of the strength of materials at very high temperatures, the Picou permeameter designed for testing the magnetic permeability of rods or strips and a bifilar galvanometer, free from zero creep. Sir William Crookes exhibited ultra-violet spectra of the metals photographed with a quartz train of five double prisms and some remarkable stereoscopic photographs taken in South Africa. The demonstrations in the meeting-room by means of the electric lantern proved, as usual, to be the great attraction of the evening. Mr. G. W. Lamplugh showed some very striking photographic slides of the Batoka Gorge of the Zambesi River, while the slides and miniature demonstrations by Professor Silvanus Thompson of the electric production of nitrates from the atmosphere were remarkably brilliant and striking. They were intended to illustrate a process for obtaining from the air products of great value for agriculture and in the dyestuff industry.

THE MIKKELSEN EXPEDITION TO THE BEAUFORT SEA.[1]

We have received from Mr. Mikkelsen a detailed statement of his plans for the expedition to the Beaufort sea, to which frequent reference has already been made in the *Journal,* and on which he proposes to sail from Victoria about the middle of May. The vessel which he has acquired for that purpose has been renamed the *Duchess of Bedford,* in honor of a prominent supporter of the expedition. She is a sailing craft of 66 tons, with a length of 67½ feet, 18 feet 9 inches beam, and 7½ feet depth of hold, and is built of camphor wood, the outside planking being of heart quakewood, which again is sheathed with gumwood above and below the water-line, and with iron plating at the bows. The ship was built as a sealer, and is specially strengthened by bulkheads, etc., to withstand ice-pressure. As already mentioned, Messrs. Leffingwell, Stefansson, and Ditlevsen will proceed down the

[1] From the *Geographical Journal.*

Mackenzie, while Mr. Mikkelsen will take the ship through Bering Strait, visiting the coast of Siberia for the purpose of collecting dogs and one or two ponies; then pushing his way along the northwest coast of Alaska, and, if possible, avoiding the pack-ice by keeping inside the shoals, which the slight draught of the ship (8 feet) should enable him to do. Beyond Point Barrow special attention will be paid, so far as time permits, to tidal observations, which are here of particular interest by reason of the sudden change of twelve hours in the tide constant which seems to take place between Harrison Bay and Herschel Island. It is hoped that the whole expedition of ten men will be united at the mouth of the Mackenzie by about August 20. Proceeding eastward past Cape Bathurst, it will cross over to Prince of Wales Strait, and endeavor to establish a depot of provisions abreast of Princess Royal Island. Retracing its course, it will establish winter quarters on Minto Inlet, where as much scientific work as possible will be carried on, while some of the men will procure fresh meat by hunting. In the spring of 1907, two men, lightly equipped and making use of the depot already formed, will endeavor to cross to Melville Island, and thence to Prince Patrick Island, afterwards making a trip of some 60 miles over the ice, and, if possible, obtaining an idea of the configuration of the sea-bottom by means of soundings. Meanwhile the scientific workers will have been extending their knowledge by means of trips from the ship, which, as soon as the ice opens sufficiently, will cross over to Nelson's Head, and endeavor to follow the coast of Banks Island to Burnet Bay, where she will unship the provisions and remain either until the autumn of 1907, or, if supplies permit, until the summer of 1908, being then sent home. In the spring of 1908, a party of three men, with the dogs and pony, will start west-northwest over the ice, with provisions for a hundred and forty days, keeping this course as nearly as possible, until soundings show that the edge of the continental shelf is passed, or land is found, or the position of 150° W., 76° 30′ N., is reached. If the first-named eventuality is realized, an endeavor will be made to reach the edge of the shelf on a southward course, and to determine its trend as far as possible, the party making for the nearest coast when provisions run short. If land should be met with, it will be examined as far as possible; but if neither this nor the edge of the shelf should be found, the explorers will push on as near as possible to the position mentioned, whence they will either endeavor to reach Wrangel Island, or make for the nearest coast, as circumstances may decide. In case the ship remains a second winter, as much scientific work as possible will be carried on at Burnet Bay, but in any case the observers left here will take the ship home independently of the other party.

MOSQUITO EXTERMINATION.

THE following is the full text of the law enacted at the last session of the New Jersey State legislature and recently signed by the governor:

CHAPTER 134.

AN ACT to provide for locating and abolishing mosquito-breeding salt-marsh areas within the state, for assistance in dealing with certain inland breeding places, and appropriating money to carry its provisions into effect.

BE IT ENACTED *by the Senate and General Assembly of the State of New Jersey:*

1. It shall be the duty of the director of the state experiment station, by himself or through an executive officer to be appointed by him to carry out the provisions of this act, to survey or cause to be surveyed all the salt-marsh areas within the state, in such order as he may deem desirable, and to such extent as he may deem necessary, and he shall prepare or cause to be prepared a map of each section so surveyed, and shall indicate thereon all the mosquito-breeding places found on every such area, together with a memorandum of the method to be adopted in dealing with such mosquito-breeding places, and the probable cost of abolishing the same.

2. It shall be the further duty of said director, in the manner above described, to survey, at the request of the board of health of any city, town, township, borough or village within the state, to such extent as may be necessary, any fresh-water swamp or other territory suspected of breeding malarial or other mosquitoes, within the jurisdiction of such board, and he shall prepare a map

of such suspected area, locating upon it such mosquito-breeding places as may be discovered, and shall report upon the same as hereinafter provided in section eight of this act. Requests as hereinbefore provided for in this section may be made by any board of health within the state, upon its own motion, and must be made upon the petition, in writing, of ten or more freeholders residing within the jurisdiction of any such board.

3. Whenever, in the course of a survey made as prescribed in section one of this act, it is found that within the limits of any city, town, township, borough or village there exist points or places where salt-marsh mosquitoes breed, it shall be the duty of the director aforesaid, through his executive officer, to notify, in writing, by personal service upon some officer or member thereof, the board of health within whose jurisdiction such breeding points or places occur, of the extent and location of such breeding places, and such notice shall be accompanied by a copy of the map prepared as prescribed in section one, and of the memorandum stating the character of the work to be done and its probable cost, also therein provided for. It shall thereupon become the duty of the said board, within twenty days from the time at which notice is served as aforesaid, to investigate the ownership, so far as ascertainable, of the territory on which the breeding places occur, and to notify the owner or owners of such lands, if they can be found or ascertained, in such manner as other notices of such boards are served, of the facts set out in the communication from the director, and of the further fact that, under chapter sixty-eight of the laws of one thousand eight hundred and eighty-seven, as amended in chapter one hundred and nineteen of the laws of one thousand nine hundred and four, any water in which mosquito larvæ breed is a nuisance and subject to abatement as such. Said notice shall further contain an order that the nuisance, consisting of mosquito-breeding pools, be abated within a period to be stated, and which shall not be more than sixty days from the date of said notice, failing which the board would proceed to abate, in accordance with the act and its amendments above cited.

4. In case any owner of salt-marsh lands on which mosquito-breeding places occur and upon whom notice has been served as above set out, fails or neglects to comply with the order of the board within the time limited therein, it shall be the duty of said board to proceed to abate under the powers given in section thirteen and fourteen of the act and its amendments cited in the preceding section, or, in case this is deemed inexpedient, it shall certify to the common council or other governing body of the city, town, township, borough or village the facts that such an order has been made and that it has not been complied with, and it shall request such council or other governing body to provide the money necessary to enable the board to abate such nuisance in the manner provided by law. It shall thereupon become the duty of such governing body to act upon such certificate at its next meeting and to consider the appropriation of the money necessary to abate the nuisance so certified. If it be decided that the municipality has no money available for such purpose, such decision shall be transmitted to the board of health making the certificate, which said board shall thereupon communicate such decision forthwith to the director of the agricultural experiment station or his executive officer.

5. If, in the judgment of the director aforesaid, public interests will be served thereby, he may set aside out of the moneys appropriated by this act such an amount as may be necessary to abate the nuisance found existing and to abolish the mosquito-breeding places found in the municipality which has declared itself without funds available as prescribed in the preceding section. Notice that such amount has been set aside as above described shall be given to the board of health within whose jurisdiction such mosquito-breeding places are situated, and said board shall thereupon appoint some person designated by said director or his executive officer a special inspector of said board for the sole purpose of acting in its behalf in abating the nuisance found to be existing, and all acts and work done to abate such nuisances and to abolish such breeding places shall be done in the name of and on behalf of such board of health.

6. If in the proceeding taken under section four of this act the common council or other governing body of any municipality appropriate to the extent of fifty per centum or more of the money required to abate the nuisance and to abolish the mosquito-breeding places within its jurisdiction it shall become the duty of said director of the agricultural experiment station to set aside out of the moneys herein appropriated such sum as may be necessary to complete the work, and in all cases preference shall be given, in the assignment of moneys herein appropriated, to those municipalities that contribute to the work and in the order of the percentage which they contribute;

those contributing the highest percentage to be in all cases preferred in order.

7. In all cases where a municipality contributes fifty per centum or more of the estimated cost of abolishing the breeding places for salt-marsh mosquitoes within its jurisdiction, the work may be done by the municipality as other work is done under its direction, and the amount set aside as provided in section six may be paid to the treasurer or other disbursing officer of such municipality for use in completing the work; but no payment shall be made to such treasurer or other disbursing officer until the amount appropriated by the municipality has been actually expended, nor until a certificate has been filed by the director or his executive officer stating that the work already done is satisfactory and sufficient to obtain the desired result, and that the arrangements made for its completion are proper and can be carried out for the sum awarded.

8. In all investigations made under section two of this act the report to be made to the board of health requesting the survey shall state what mosquitoes were found in the territory complained of, whether they are local breeders or migrants from other points, and, in the case of migrants, their probable source, whether the territory in question is dangerous or a nuisance because of mosquito breeding, the character of the work necessary to abate such nuisance and abolish the breeding places, and the probable cost of the work. Said board of health must then proceed to abolish the breeding places found under the general powers of such boards, but if it shall appear that the necessary cost of the work shall equal or exceed the value of the land without increasing its taxable value, such board may apply to the director aforesaid, who may, if he deems the matter of sufficient public interest, contribute to the cost of the necessary work, provided that not more than fifty per centum of the amount shall be contributed in any case, and not more than five hundred dollars in any one municipality.

9. All moneys contributed or set aside out of the amount appropriated in this act by the director of the agricultural experiment station in accordance with its provisions shall be paid out by the comptroller of the state upon the certificate of said director that all the conditions and requirements of this act have been complied with, and in the case provided for in section five payments shall be made to the contractor upon a statement by the person in charge of the work, as therein prescribed, attested by said director, showing the amount due and that the work has been completed in accordance with the specifications of his contract.

10. For the purpose of carrying into effect the provisions of this act, the said director of the state agricultural experiment station shall have power to expend such amount of money, annually, as may be appropriated by the legislature; *provided*, that the aggregate sum appropriated for the purposes of this act shall not exceed three hundred and fifty thousand dollars. The comptroller of the state shall draw his warrant in payment of all bills approved by the director of the state experiment station, and the treasurer of the state shall pay all warrants so drawn to the extent of the amount appropriated by the legislature.

11. This act shall take effect November first, one thousand nine hundred and six.

Approved April 20, 1906.

The appropriation bill makes only $13,500 of the total amount available for the fiscal year beginning November 1, 1906, and as that date is so near to the close of the season that little if anything can be done before the marshes freeze up, the beginning of actual work will probably be delayed until the spring of 1907.

JOHN B. SMITH.

NEW BRUNSWICK, N. J.,
May 23, 1906.

THE AMERICAN ASSOCIATION OF MUSEUMS.

THE assembly which convened on May 15 at the American Museum of Natural History in New York for the purpose of organizing an association of the museums of North and South America, was very largely attended. Among those who came from great distances in order to testify to their interest in the movement were Mr. W. A. Bryan, of the Bernice Pauahi Bishop Museum, Honolulu; Mr. J. E. Talmage, of the Deseret Museum, Salt Lake City; Professor E. H. Barbour, of the University of Nebraska; and Mr. P. M. Rea, of the Museum of the College of Charleston, S. C. The Field Museum of Chicago, the Art Institute of Chicago, the St. Louis Public Museum, the various museums and art institutions of Boston and vicinity, the museums of various kinds located in the vicinity of New York, as well as the museums of

Philadelphia, Pittsburg and other leading cities, were well represented.

The meeting was called to order at 10:30 A.M., by Dr. W. J. Holland, and upon his motion Dr. Hermon C. Bumpus, the director of the American Museum of Natural History, was made temporary chairman. Dr. George A. Dorsey, of the Field Museum of Natural History in Chicago, was made temporary secretary. A committee on permanent organization, consisting of Dr. W. J. Holland, of the Carnegie Museum; Dr. Wm. M. R. French, of the Art Institute of Chicago; Professor P. M. Rea, of the College of Charleston; Dr. James E. Talmage, of the Deseret Museum of Salt Lake City; and Dr. W. P. Wilson, of the Philadelphia Commercial Museums, was appointed.

Many interesting papers were read and discussed. Luncheon was served at the American Museum of Natural History during the first day's session.

The second session, held on May 16, convened at the Museum of the New York Botanical Garden in Bronx Park. A final organization was effected by the election by ballot of Dr. Hermon C. Bumpus as president, Dr. Wm. M. R. French as first vice-president and Dr. W. J. Holland as second vice-president. Dr. George A. Dorsey was chosen secretary and Dr. W. P. Wilson treasurer. Councilors were elected as follows: To serve for three years—Dr. Richard Rathbun, of the United States National Museum; Professor E. S. Morse, of the Peabody Academy of Sciences, Salem, Mass. To serve for two years—Dr. N. L. Britton, of the New York Botanical Garden; Professor J. E. Talmage, of the Deseret Museum, Salt Lake City. To serve for one year—Mr. F. A. Lucas and Dr. Wm. H. Goodyear, both of the Brooklyn Institute.

The officers and the six councilors constitute the council of the association, which formally assumed the name of 'The American Association of Museums.' A temporary constitution was adopted. All persons who were present and participated in the meeting, as well as all persons who by letter had signified their adhesion to the movement, were by formal vote constituted charter members. This gives the association a large membership at the outset, which it is hoped will be very rapidly increased.

It is provided in the constitution that *all* those who are *actively engaged in the work of museums* may become *'active members'* of the association upon payment of the sum of two dollars annually.

Museums contributing not less than ten dollars per annum may become *'sustaining members,'* and shall be entitled to vote through their chief executive officers, if present at the meeting, or by a formally appointed delegate.

Provision is made in the temporary constitution for *'associate members,'* consisting of *those* who are *not actively engaged in the work of museums; 'honorary members,'* the number of whom shall be restricted to fifteen, and *'patrons.'*

Active members may upon payment of thirty dollars at one time be exempt thereafter from the payment of annual dues.

It is proposed to initiate, so soon as the way may be clear to do so, a journal, or publication, in the interest of museums.

A very gratifying feature was the receipt of a number of letters from the heads of museums in South America, giving in their adhesion to the movement. A congratulatory telegram from Dr. W. E. Hoyle, on behalf of the British Museums Association, was received with much applause.

A rising vote of thanks was given to Dr. W. J. Holland for his services in bringing about the formation of the society.

The luncheon given by the New York Botanical Garden to the delegates, at 'the Hermitage,' near Bronx Park, was a most delightful affair, and Dr. Hermon C. Bumpus and Dr. N. L. Britton won the hearts of all by their most gracious hospitality.

The gathering was declared by all who were present to be most successful, and it is doubtful whether any movement for the formation of an international association of this kind has ever been larger or more enthusiastic.

The association adjourned to meet at the call of the council in the spring or early sum-

mer of 1907 at the Carnegie Museum in the city of Pittsburg.

THE ITHACA MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

EXCURSIONS.

THE surroundings of Ithaca in summer are peculiarly attractive and it is proposed to make short trips to neighboring points of interest a feature of the coming meeting.

Some sections intend to make this essentially a field meeting and the local committee on excursions has arranged the following list of expeditions for their benefit.

Botanical Excursions.—Friday morning, June 29, a brief excursion in the immediate vicinity of Ithaca.

Saturday, June 30, an all day excursion to the morainic region near Cortland, to visit the peat-bog formations and also the marl ponds. This excursion will be by rail or by carriage.

Monday, July 2, an all day excursion to Enfield Gorge some five miles from the university. The conveyance will be by carriages and tally-hos.

Details of these excursions will be given in the program of Section G.

Chemical Excursions.—Thursday, June 28, excursions in charge of several committees have been arranged from 4 to 6 P.M., to visit various points of interest in the buildings and upon the grounds of the university.

Friday, June 29, an afternoon excursion has been arranged for the members of the Chemical Society in the nature of a boat ride on Cayuga Lake with dinner at Sheldrake.

Geological Excursions.—Friday, June 29, an excursion conducted by Mr. R. H. Whitbeck to Turkey Hill, by carriage or on foot, for a general view of surface geology. A paper on 'Cycles of Erosion' will be read by Mr. P. F. Gulliver.

Saturday, June 30, an all day excursion to points of interest about the south end of Cayuga Lake will be conducted by Professor G. D. Harris.

Monday, July 2, Professor Harris will conduct a party to the points of interest at the north end of Cayuga Lake, including a visit to Cayuga to see the lowest rocks exposed in this region, *i. e.*, the Eurypterus beds, and other points of interest. A printed guide to the region will be furnished *gratis* to each member by the conductor.

Tuesday, July 3, an excursion to Enfield Glen by carriage will be conducted by Mr. Whitbeck, and a paper on the geography of the region will be read by Professor C. R. Dryer.

Fuller details of these excursions will be printed in the preliminary announcement and in the programs of the sections.

Excursion to the George Junior Republic.—This excursion will be arranged at the time most convenient to the visitors and will be of both general and special interest.

Opportunities will be afforded also to visit Taughannock Falls, the highest water fall in the state of New York, Enfield Falls and other of the numerous glens in the vicinity of Ithaca.

Steamers make two round trips daily, Sundays included, the entire length of Cayuga Lake. Watkin's Glen may be reached by rail, *via* Geneva or by a twenty-mile carriage drive from Ithaca.

The excursion announced above by the American Chemical Society on Friday afternoon will take place after the dedication of the new Physical Laboratory.

SCIENTIFIC NOTES AND NEWS.

DR. JOHN M. CLARKE, of Albany, and Dr. J. J. Sederholm, director of the Geological Survey of Finland, have been elected foreign correspondents of the Geological Society of London.

PROFESSOR DAVID HILBERT, of Göttingen, and Professor Wilhelm Ostwald, have been elected honorary members of the Academy of Sciences at Copenhagen.

THE University of Göttingen has awarded the income of the Valbruch foundation of the value of $3,000 to Professor Ossian Aschan, of Helsingfors, for his work on the alicyclic compounds.

In addition to a chair in the University of Paris, the French government has given Mme. Curie a pension of 12,000 francs.

Professor Wilhelm Ostwald has resigned the professorship of chemistry at the University of Leipzig, having earned the right to retire with a pension.

The family of the late Professor Langley, of the Smithsonian Institution, has given over to the institution the medals and decorations that had been presented to him in recognition of his scientific researches.

The class of 1909 of the Cornell Medical School, on May 18, presented to Dr. Austin Flint a silver loving cup in memory of his retirement from the chair of physiology. Professor Flint celebrated his seventieth birthday on March 28.

Mr. Chas. C. Adams, curator of the University Museum of the University of Michigan, has accepted a curatorship at the Cincinnati Museum.

Dr. Gust. Eberhard has been promoted to the position of observer in the Astrophysical Observatory at Potsdam.

Professor Reichenow, curator in the Zoological Museum at Berlin, has been appointed assistant director, and Dr. Vanhoeffen, of Kiel, has been appointed curator.

At the sixth annual session of the American Association of Pathologists and Bacteriologists, held last week at the Johns Hopkins Medical School, officers for next year were elected as follows: *President,* Dr. William H. Welch, Johns Hopkins University; *vice-president,* Dr. A. S. Warthin, University of Michigan; *secretary,* Dr. H. C. Ernst, Harvard Medical School; *treasurer,* Dr. H. W. Williams, University of Buffalo.

Professor Francis Gano Benedict, professor of chemistry, Wesleyan University, addressed the Washington Academy of Sciences, on May 17, on 'The Respiration Calorimeter and Factors of Human Nutrition,' illustrated by lantern slides. The paper was discussed by Dr. J. B. Nichols, Professor E. B. Rosa, Dr. C. F. Langworthy and others.

Dr. L. A. Bauer, as lecturer on terrestrial magnetism, gave the following course of illustrated lectures at the Johns Hopkins University, May 23–25:

1. 'Principal Phenomena of the Earth's Magnetism.'
2. 'Magnetic Surveys of Land and Oceanic Areas.'
3. 'Magnetic Observatory Work (Variation of the Earth's Magnetism, Magnetic Storms, Earthquake and Volcanic Effects).'
4. 'Recent Analyses of the Earth's Magnetic Field.'

The annual oration before the Medical Society of London was delivered by Professor Kocher, of Berlin, on May 21. Professor Kocher spoke on some contributions to the pathology of the thyroid gland. Subsequently a conversazione was held.

Professor Daniel S. Martin, of Brooklyn, N. Y., lectured recently before the College of Charleston Museum on 'The Occurrence of Precious Stones in the United States.'

President James B. Angell, of the University of Michigan, will give the baccalaureate address at Purdue University on June 3. The address at the graduating exercises on June 5 will be given by Professor Albion W. Small, of the University of Chicago.

The 327th regular meeting of the Middletown Scientific Association was held in the Scott Laboratory of Physics, Wesleyan University, on May 15. Norman Everett Gilbert, professor of physics in Dartmouth College, gave an address, illustrated with lantern slides, on 'The Observation of a Solar Eclipse.'

Dr. Don Armour, demonstrator of anatomy at the Rush Medical College, has been appointed senior assistant surgeon in the National Hospital, London, England.

Mr. Marconi has been very ill during the last month, but is now recovering.

The vice-presidents of the Royal Institution for next year are as follows: Lord Alverstone, Sir William Huggins, O.M., Lord Kelvin, O.M., Dr. Ludwig Mond, Lord Sanderson, Sir James Stirling, Sir James Crichton-Browne (treasurer) and Sir William Crookes (honorary secretary).

THE trustees of the College of Charleston Museum have elected the following as honorary curators: Professor Daniel S. Martin, of Brooklyn, N. Y., honorary curator of minerals, rocks and invertebrate fossils; Mr. Wm. G. Mazyckm, of Charleston, S. C., honorary curator of recent shells; Mr. Arthur T. Wayne, of Mt. Pleasant, S. C., honorary curator of birds.

DR. TH. MORTENSEN, of the Zoological Museum at Copenhagen, is at present in the United States. During a year's leave of absence he has been studying the fisheries in the West Indies, and for several weeks has been working in the National Museum in Washington.

THE *Journal* of the New York Botanical Garden contains a notice of the recent expedition of the director-in-chief, Dr. Britton, to Porto Rico. Dr. Britton and Dr. Howe, accompanied by Professor W. M. Wheeler, of the American Museum of Natural History, spent ten days in the early part of March on the island of Culebra, where the facilities of the U. S. Naval Station were courteously placed at the disposition of the party. In the collections made at this point the Cactaceae and marine algae were especially well represented. Mrs. Britton, Miss Delia W. Marble and Mr. John F. Cowell, in the meantime, explored the mountains and foothills in the neighborhood of Mayagüez in the western part of Porto Rico, afterward joining the rest of the party at Arecibo for a trip across the island over the Adjuntas road. A stop of a week was made at Utuado, where two of the higher mountains of the island were climbed. From Ponce, on the south shore, the return to San Juan was made over the military road. The dried specimens of plants secured by the expedition are represented by about 1,700 numbers and in addition a large amount of living material was brought back.

PROFESSOR ANGELO HEILPRIN, who recently returned from the island of Martinique and from an extended journey into the forest region of British Guiana, made the descent into the crater and partial ascent of the still-steaming dome of Mount Pelée, on February 27, last. The dome is covered by a wilderness of boulders, some of them of giant size, coming from the fallen obelisk, and the fragments, where examined, were in all cases found to be a compact and non-vesicular andesite. Professor Heilprin does not believe that the evidence justifies Professor Lacroix's views as to the method of formation of the volcano's unique excresence. A scattered vegetation of diminutive tree-ferns has already appeared on the dome itself, in most cases bordering the steam-vents (so-called fumaroles) of the eastern face.

IN its account of the exhibition of the Royal Academy the London *Times* says: "In the place in Room IV. where we last year saw the Blenheim family group, we have now a marvelously fine composition with full-length portraits of four professors in the Johns Hopkins University, Baltimore. Messrs. Welch, Halstead, Osler and Kelly are all well-known figures in the world of learning and science, but each and all may adopt with truth the phrase that Gladstone used about Millais's portrait, and say that Mr. Sargent has immeasurably increased their chances of immortality. The necessary *vates sacer* has appeared in the form of a master of the brush, and has preserved for posterity their form and lineaments; while on us of to-day, even if the men themselves are little more than names, the painter has conferred the pleasure that a first-rate work of art must always give. It is a little sombre in color, but that is perhaps in keeping with academical dignity, while the dexterous way in which the artist has used the hoods, the books and the globe to relieve the gloom of gowns and backgrounds is beyond praise."

A FACULTY committee has been appointed to look into the possibility of securing a portrait of the late Professor Shaler to be hung in the faculty room of Harvard University. The committee is endeavoring to secure recent photographs and has sent a request that any graduate who may have such a photograph, mail it to Professor John E. Wolff, University Museum, Cambridge, who will acknowledge its

receipt, and who will be responsible for safe keeping and ultimate return.

On August 13, 1906, Professor M. J. de Goeje, of the University of Leyden, will celebrate his seventieth birthday. In view of the valuable services that Professor de Goeje has rendered to Oriental science, and which have secured for him his present position as the leading Arabic scholar of the day, a central committee has been organized in Holland with representatives in other countries to arrange for a celebration that will be worthy of the occasion. The central committee, after careful deliberation, has decided that the worthiest tribute to Professor de Goeje would be the establishment of a de Goeje memorial fund, the interest of which should be used for furthering Oriental researches through stipends to worthy students of Oriental lore, through subventions to scientific publications and through grants for travels and explorations. In order to carry out this plan, a fund of $5,000 is to be raised. Of this sum $2,000 have already been secured in Holland. English scholars and others interested in the subject have up to the present forwarded to the central committee about $1,500 and from Germany about $1,000 have been contributed. A committee has been formed in the United States, which wishes to collect one thousand dollars as a contribution to the memorial. Subscriptions should be sent to the secretary, Professor Morris Jastrow, Jr., University of Pennsylvania, Philadelphia, Pa.

Professor George A. Wentworth, who was professor of mathematics at Phillips Exeter Academy from 1859 to 1892 and was the author of well-known text-books on mathematics, died, on May 24, of heart failure, aged seventy-one.

Professor Buchenau, known for his work in botany, died in Bremen on April 23, at the age of seventy-five years.

Dr. F. M. Carlinski, emeritus professor of astronomy and director of the observatory at Cracow, died on March 21, at the age of seventy-five years.

The senate passed, on May 24, the bill admitting free of duty alcohol denaturized for industrial purposes. The provision will take effect on January 1, 1907.

The Cornell chapter of Sigma Xi is preparing to celebrate the twentieth anniversary of the foundation of the society. A public address is to be given on the evening of July 2, to which all members of *The American Association for the Advancement of Science* and of affiliated societies who are in attendance at the Ithaca meeting will be invited. After the address there will be a dinner at which all visiting members of Sigma Xi will be the guests of the parent chapter.

The International Astronomical Society will hold its twenty-first meeting at Jena from September 12 to 15.

UNIVERSITY AND EDUCATIONAL NEWS.

The new buildings of the Harvard Medical School will be dedicated on the afternoon of September 25 and the morning of September 26.

Yale University has received an anonymous gift of $5,000 to the forestry school, the income of which is to be used for the publication of works on forestry by graduates and members of the faculty.

Professor Ernest W. Brown, M.A., D.Sc. (Cambridge), of Haverford College, has accepted the chair of applied mathematics at Yale University, but will remain at Haverford during the coming academic year.

Dr. John W. Baird, instructor in psychology at the Johns Hopkins University, has accepted a similar position in the University of Illinois.

Professor Bird T. Baldwin, Ph.D. (Harvard, 1905), of the West Chester State Normal School, during the coming year will have charge of psychology and educational psychology at Swarthmore College, where a new training school for teachers is being organized.

Dr. J. T. Porter, instructor in physics in Williams College, has been appointed adjunct professor of physics in Randolph-Macon College.